DOCUMENT RESUME

ED 115 503 SE 019 936

AUTHOR	Ibukun, Olu, Ed.
TITLE	Science and Technology Education Newsletter, No. 5, October 1975. A Supplement to the Bulletin of the Regional Office of Science and Technology for Africa.
INSTITUTION	United Nations Educational, Scientific, and Cultural Organization, Dakar (Senegal). Regional Office for Education in Africa.; United Nations Educational, Scientific, and Cultural Organization, Nairobi (Kenya). Regional Office of Science and Technology for Africa.
PUB DATE	Oct 75
NOTE	18p.
EDRS PRICE	MF-$0.76 HC-$1.58 Plus Postage
DESCRIPTORS	*Curriculum Development; Elementary Education; *Elementary School Science; International Education; Newsletters; *Science Education; Seminars; *Technical Education; *Universities
IDENTIFIERS	Africa; UNESCO

ABSTRACT

This bi-annual publication appears as the result of efforts of the science and education sectors of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the UNESCO Regional Office of Science and Technology for Africa, and the UNESCO Regional Office for Education in Africa. The newsletter provides a forum for the interchange of views, ideas, and information on science and technology education, at all levels, among those working in Africa. Among topics in this issue are reports on the UNESCO Seminar on the Improvement of Science Education in Africa, Nairobi, Kenya, August 1975; the African Regional Seminar for Advanced Training in Systematic Curriculum Development and Evaluation, Greenhill, Ghana, July-August 1975; and a Seminar on the Teaching of Sciences in Primary Schools Using the Environment. An information service available to science educators in Africa and books available from UNESCO are also discussed. (Editor/CP)

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SCIENCE AND TECHNOLOGY EDUCATION NEWSLETTER

A Supplement to the Bulletin of the Regional Office of Science and Technology for

No. 5

October 1975

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SCIENCE AND TECHNOLOGY EDUCATION NEWSLETTER

SCOPE AND PURPOSE

The Science and Technology Education Newsletter appears twice a year as a collaborative effort between the science and education sectors of UNESCO and particularly between the UNESCO Regional Office of Science and Technology for Africa (Nairobi) and the UNESCO Regional Office for Education in Africa (Dakar).

The Newsletter provides a forum for the interchange of views, ideas and information on science and technology education, at all levels, among those working in Africa. It also carries news and information drawn from the wider world community, when these relate to Africa. Readers are invited to submit material for the Editor's consideration. It should be noted that material bearing a writer's name is his responsibility and not that of the Editor or UNESCO.

EDITORIAL

The Conference of Ministers of African Member States Responsible for the Application of Science and Technology to Development (CASTAFRICA) (Dakar, Senegal, January 1974) expressed concern over the role of universities in scientific and technological development in Africa. Some of its recommendations were directed to authorities of African Universities, while it requested UNESCO to work closely with the regional bodies in Africa (ECA, OAU and the Association of African Universities) in tackling many of the problems of University education in Africa.

This Conference reviewed the contribution of universities in Africa to science and technology, in the light of the small number of trained scientists and science educators in Africa compared with the rest of the world. Data on 33 African countries collected by UNESCO in 1969 showed 61% for humanities, education, fine arts, law and social sciences and only 33% for the scientifically-based disciplines (of which 12.8% is in natural sciences, 5.3% in engineering, 10% in medical sciences and 4.8% in agriculture). This revealed a predominance of humanities and social sciences for almost all the countries. In fact, for 7 countries - Cameroon, Congo, Liberia, Morocco, Somalia, Togo and Upper Volta - the proportion of students in the non-scientific disciplines was as high as 80%.

Since 1969, the enrolment at universities in Africa and also the number of graduate students have been on the increase, but there is no indication that the percentage distribution in the scientific and non-scientific disciplines is likely to have been significantly affected.

These shortcomings pose great problems for national development and we feel that it poses a strong challenge to science educators and university administrators. More young Africans have to be persuaded to take to university science education. Yet it is obvious that in a

free society young persons have to be allowed some freedom of choice. In choosing a career many young persons take note of the facilities and chances of success among other considerations. It then becomes clear that greater effort should be made to aid and improve the learning process as well as the facilities in university science faculties. The quality of science teachers and scientific equipment at primary and secondary school levels, as well as at university level, will have to be re-examined. Otherwise, students will continue to show preference for what appear to be the safer areas of classic and liberal studies where books can be bought and read, and the subject mastered, rather than the use of the experimental method with poor equipment and quite often inadequate teaching personnel and techniques.

It was within this above context then that UNESCO convened the Seminar for the Improvement of Science Education in African Universities. The reader is invited to see the report on its discussions and conclusions appearing on page 5 of this issue of the Newsletter.

Chief Olu IBUKUN,
Head of the UNESCO Regional Office of
Science and Technology for Africa,
P.O. Box 30592,
Nairobi, KENYA

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NOTICE BOARD

CALENDAR OF MEETINGS FOR 1975

ICASE - UNESCO Meeting of Leaders of Science Teacher's Associations in Africa - on the occasion of the 20th Anniversary of the founding of the Ghana Association of Science Teachers (GAST). Accra, Ghana, 3 - 8 November 1975.

For information, write to: Mr. Ohene-Asare,
Secretary-General of GAST,
c/o Inspectorate Division,
Ghana Teaching Service,
P.O. Box M.188, Accra, GHANA.

Regional Colloquium on the Role of Arab Universities in Scientific Development with Special Emphasis on Application to Technology and Environment. Ain Shams University, Cairo, Egypt, 17 - 20 November 1975.

For information, write to: UNESCO Regional Office of Science and Technology for the Arab States,
8, Sh. El Salamalik, Garden City,
Cairo, ARAB REPUBLIC OF EGYPT.

COURSES AND STUDY OPPORTUNITIES

A programme of study and travel grants, financed from UNESCO's Regular Budget, is being inaugurated to assist chemical educators from developing countries to study innovations in their regions and to attend international scientific gatherings.

For more information, write to: Division of Scientific Research and Higher Education,
UNESCO,
7 Place de Fontenoy,
75700 Paris, FRANCE.

NOTICE BOARD (Contd.)

Fellowships and Postgraduate Scholarships

The Department of Chemistry, University of Ibadan (Nigeria) is promoting inter-African co-operation in suitable research projects by making available its excellent facilities to visiting scientists and graduate students. A recent grant from the Rockefeller Foundation has provided funds for such co-operation.

Visiting Research Fellows provide return air passage to Ibadan and a stipend of N 700 to cover the living expenses for a three-month period. The Fellow will be expected to carry out research in collaboration with the staff of the Department of Chemistry.

These fellowships are available for any three-month period in the next two years. Apply, indicating research interests, to:

Head of the Department of Chemistry,
University of Ibadan, Ibadan, NIGERIA.

From: The Bulletin of the Association of African Universities, Vol. I, No. 2, November 1974.

International Courses, Fellowships and Scholarships in Hydrology

Available from UNESCO: a provisional list of international post-graduate courses in hydrology, scholarships for attending these courses and other fellowships in hydrology. Intended to help prospective participants to choose the course that best fits their requirements and to make use of existing scholarships and fellowships.

12th International Seminar for Research and Education in Chemical Engineering and Physical Chemistry, Karlsruhe, FEDERAL REPUBLIC OF GERMANY, 2 May to 15 July 1976.

Closing date for application: 15th October 1975

Requests for more information and application forms should be directed to:

The International Seminar,
Universitat,
75 Karlsruhe, Marstrasse 42 - 44,
FEDERAL REPUBLIC OF GERMANY.

UNESCO SEMINAR ON THE IMPROVEMENT OF SCIENCE EDUCATION IN AFRICA*, NAIROBI, KENYA, 11-13 AUGUST 1975

The preceding issues of this Newsletter described plans to convene the UNESCO Seminar on the Improvement of University Science Education in Africa (see Newsletter No. 4, December 1974, pp. 15-16). That Seminar has now taken place, convening in Nairobi, Kenya, 11 - 13 August 1975.

Ten representatives of faculties of science in Africa participated as officially-invited delegates on the basis of preparatory work they had done at their individual faculties of science. In addition, observers from the Association of African Universities and the U.N. Economic Commission for Africa attended and another 20 teachers and professors of science also participated, representing universities in Kenya, Ghana, Zambia, Malawi, Tanzania and Botswana, Lesotho and Swaziland.

The Seminar discussed three major topics related to the improvement of university science education in Africa.

Topic 1: Student Background

Many students in Africa come to university from rural areas where gadgets, toys and other simple instruments are non-existent. One result of this is that they experience difficulties in handling instruments in a science laboratory. Also, few schools have proper laboratory facilities for the teaching of science. Moreover, students receive little motivation for doing science from their home backgrounds, where frequently parents have had little educational background. Thus, special effort is required beginning at the primary school level, to create student interest in science.

Unaware of the importance of science in the solution of everyday problems, many African students choose professional careers first despite

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* Adapted from the Final Report on the Seminar submitted to UNESCO by Professor D. Odhiambo, University of Nairobi, member of the Organizing Committee of this Seminar.

the limited job opportunities these offer. Few girls do science at university probably because few secondary schools in the continent have proper facilities for science teaching. Therefore, there is need to stimulate interest in science subjects and to popularize science through science fairs and other extra-curricular activities involving the community.

Other factors bearing on student background were discussed, such as superstition and religious beliefs, health problems, the teaching of New Mathematics to science students, and examinations.

On this topic of Student Background, the meeting recommended that Governments set definite policies to correct the over-emphasis on professional subjects at the expense of science; induce properly trained local teachers to remain in teaching and use resources to establish centres of excellence instead of ill-equipped schools.

Faculties of science and education in Africa should investigate educational problems relating to student background.

Topic 2: Experimentation and Innovation in African Universities

Large student/teacher ratios reflect scarcity of qualified personnel in Africa. To alleviate the resulting large classes, tutorial centres with close contact between student and lecturer need to be set up.

In recent years, many lecturers have been experimenting with newer methods of transmitting information to the student. One such method is the Keller Plan*, based on self-pacing. The Keller Plan should be started in a small way since it is only suitable for smaller classes. The Plan was felt to be best suited for teaching concepts rather than factual data. Administratively, the Keller Plan needs large inputs of personnel and manhours. Its main disadvantages are student procrastination, different rates of module completion, and shortening of syllabus to about 75% of what is normally taught.

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* Editor's note: Universities can obtain descriptive materials on the Keller Plan as practised in U.S.A., Europe and elsewhere by writing to the UNESCO Regional Office of Science and Technology for Africa, Nairobi, Kenya.

Science curricula in universities should be given strong practical orientation by:

a) preparing students to work in industries;

b) incorporating local materials, examples and problems into curricula;

c) assigning laboratory projects which combine several techniques to teaching manipulative skills;

d) involving students in research projects and giving seminars, thus motivating and identifying possible future university teachers.

Other aspects of experimentation and innovation were discussed: audiovisual aids to be required equipment in a teaching classroom, use of objective examinations, career counselling officers in universities to inform students about careers in science.

Topic 3: Role of the University Science Teacher in the Innovation Process

Every university should provide facilities for training and retraining of its science teachers. They should review the training process, the lecturer's role, techniques of lecturing, audiovisual aids, small group teaching, self-instructional methods, project work, etc. University lecturers should sollicit students' views and criticisms as feedback.

The Seminar recommended the establishment of an education resource materials centre in Africa; encouragement of textbooks with materials and examples relevant to Africa's needs; and a sub-regional centre for the training of university science teachers.

The Seminar further recommended creating an association of the Faculties of Science of African Universities. A small committee consisting of: Professor D. Odhiambo, Chairman; Professor P. Makhurane (U.B.L.S., Gaborone); and Professor M.O. Williams (Sierra Leone) (representatives of French-speaking and Arab-speaking African Universities will be added) is now planning the organization of this association and preparing a draft constitution. It will submit its report to the faculties of science by March 1976 and convene a full meeting of the faculties later in 1976.

THE ASSOCIATION OF AFRICAN UNIVERSITIES

The Association of African Universities (AAU), founded in 1967 in Rabat (Morocco), encourages and promotes co-operation among universities in Africa - the sharing of facilities and of material and human resources - for the development of African nations. Its major programmes are:

The Student Exchange Programme

This programme is designed to enable African students to study in fields that are not available in their own countries. Many of these fields of study are science-based courses, such as Agriculture, Medicine, Veterinary Medicine, Forestry, Engineering, Architecture, etc. Moreover, studies done in African universities offer conditions approximating to their home environments. There are some 748 students from 41 African countries studying in 34 universities in Africa today under this programme.

The Staff Exchange Programme

It is common knowledge that some African universities face a perennial problem of shortage of qualified, competent or specialized staff, especially in the sciences or science-based professions. The AAU has established a Staff Exchange Programme to assist member universities in solving, at least partially, this problem of staff shortage, by providing passage for a professor in a specialist field from one university to teach at another for a given period. This programme also offers opportunity for promoting joint research projects and postgraduate training programmes.

Workshops/Seminars

The Association is sponsoring seminars and workshops on various subjects taught in member universities. In July 1972, a major workshop was organized on the theme "The African University in the 1970s - Emerging Issues"*. One of the recommendations of this workshop was the need for a

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* Editor's note: Out of this came a book which is useful to understanding the universities of contemporary Africa: "Creating the African University", edited by T.M. Yesufu. Oxford University Press (Ibadan). 1973.

critical review of the curriculum, content and teaching of the various subjects in African universities with a view to making these subjects more relevant to the needs and development of the continent of Africa. In implementing the above recommendation, the AAU is organizing a series of workshops, particularly in the sciences or science-based subjects. The first such workshop will be held in Dakar (Senegal) on the "Teaching of Mathematics in African Universities". The Workshop will cover the following main areas:

a) The content of syllabus - a critical review of Mathematics syllabuses and how these can be improved in the sub-regions of the continent of Africa, namely: North Africa, East and Central Africa, English-speaking West Africa and French-speaking Africa;

b) Methodology, teaching material and teaching aids, textbooks, etc.;

c) Co-operation and the organization of joint research, postgraduate training programmes and the exchange of information.

The Documentation Centre

The Association maintains this Centre as a kind of central library for the exchange and dissemination of information to member universities and the university community at large. To this end, the Centre will publish in due course almost all research projects, particularly in science and technology, that have been undertaken or are being undertaken by staff of member universities. The Research Report undoubtedly will serve as a useful source of information to promote joint research activities, as well as in selecting specialist Professors or External Examiners under the Staff Exchange Programme. The Centre also publishes twice a year a Bulletin on various topics of higher educational interest to Africa. Articles are intended to stimulate discussion on the various educational problems facing the continent. It is hoped that in future the Bulletin will contain, or as a supplement to it, articles on scientific research in member universities.

Mr. M.E. DEGANUS,
Special Assistant to the Secretary-General,
Association of African Universities,
P.O. Box 5744, Accra, GHANA.

REPORTS FROM THE SCIENCE EDUCATION PROGRAMME FOR AFRICA (SEPA)

A SEMINAR ON THE TEACHING OF SCIENCE IN PRIMARY SCHOOLS USING THE ENVIRONMENT

A regional seminar on integrated environmental science education, the fourth in a series promoted by the Science Education Programme for Africa (SEPA), took place in Brazzaville, Congo, from 20 to 30 May 1975. SEPA organized the seminar in collaboration with UNEP and with the technical support of UNICEF and UNESCO. The Government of the People's Republic of Congo hosted the seminar, giving support such as secretarial staff and transport.

The nineteen participants represented eight Central African States - Cameroon, Central African Republic, Chad, Congo, Gabon, Madagascar, Rwanda and Zaire.

The Seminar provided a forum for participants to discuss how objects and situations in a given environment could be used to help children develop scientific aptitudes and attitudes. Much emphasis was placed on the practical approach to stress the active method of the learning process and to demonstrate its effectiveness. In this connection, four practical sessions were held:

1. Two "experimental" classes were arranged with the aid of class teachers in a rural setting. The first class took place in a nearby farm where the children themselves suggested measuring the pond and studying the garden and piggery. The second class made electric circuits from various conductors, bulbs, etc. and did experiments on "Things that float and things that sink".

2. A traditional class was observed by participants to enable them to compare the teaching methods employed in the two

situations and to discuss the principles involved.

3. Visits were made to the site of cataracts to enable participants to explore a natural environment for teaching of science at various levels.

4. In a practical session on the development of the child, participants administered psychological tests to ten children drawn from an elementary school, testing psycho-motor, cognitive and affective domains. The session showed the usefulness of psychological tests as well as the caution required in administering such tests. It showed that the child does not think the way an adult does, but that his reasoning goes through certain stages of development.

At the end of the Seminar, participants recommended that a regional office of SEPA should be established in Central Africa to facilitate the exchange of experiences and documents between francophone and anglophone African countries and to encourage science education in Central Africa.

Mr. P.R. NYAKU,
Science Education Programme for Africa,
P.O. Box 9169 Airport,
Accra, GHANA.

Note to readers: The final report on the UNESCO/UNICEF Basic Education Seminar in Eastern Africa, held in Nairobi in August 1974, is now available and copies may be obtained by writing to UNICEF, P.O. Box 44145, Nairobi, Kenya.

THE AFRICAN REGIONAL SEMINAR FOR ADVANCED TRAINING IN SYSTEMATIC CURRICULUM DEVELOPMENT AND EVALUATION - GREENHILL, GHANA, 14 JULY - 15 AUGUST 1975

The African Regional Seminar was organized by the International Institute of Educational Planning (IIEP, Paris) and the International Curriculum Organization, in consultation with the German Foundation for International Development (DSE), the UNESCO Secretariat (Paris) and the UNESCO Regional Office for Education in Africa (Dakar).

The seminar brought together participants from 11 English-speaking African countries: Cameroon, the Gambia, Ghana, Kenya, Liberia, Malawi, Nigeria, Sierra Leone, Tanzania, Uganda and Zambia. Observers attended from the Curriculum Development Centre of Malaysia, the Curriculum Centre in Swaziland and the UNESCO Institute for Education, Hamburg, Germany. A high proportion of the faculty for the seminar came from the African region itself.

The aim of the seminar was to provide intensive training in systematic curriculum development and evaluation at a high level for curriculum workers in the region. For many participants, this was the first opportunity for such training. It also acted as a forum for those working in the various fields of curriculum development and evaluation in countries where the problems to be faced are often similar and where the exchange of experiences and ideas could be very valuable for individual centres in terms of how they can improve particular aspects of their own curriculum development work.

The course in "General Principles of Curriculum", attended by all participants, considered these issues:

1. The state of the art in curriculum development;
2. The many forces (social, political, economic) affecting curriculum development work and the ways in which the necessary experts can be identified and used;
3. Methods and the uses of evaluation of curriculum and how evaluation can be built into curriculum development process;

4. How the software and hardware of educational technology can be used in curriculum development;
5. The ways in which teacher training (both pre-service and in-service) must be linked to curriculum reform.

Mr. R.W. Tyler and Mr. B. Bloom were key speakers during this course.

Practical work was carried on in seminars on Science, Mathematics, Social Studies, Language, Curriculum Planning and Implementation and Curriculum Evaluation and Research. Each seminar reviewed the nature of the subject matter in the specific subject area in terms of sequencing the subject throughout the school system and attempted to create a learning unit in the subject.

The Seminar in Curriculum Planning and Implementation examined the various models which exist in the various socio-economic political contexts for innovation, reform, evaluation and spreading of curricula throughout an entire school system. Emphasis was laid on how curriculum revision cycles could be speeded up. The Evaluation group reviewed the state of the art of curriculum evaluation, the use of existing survey data for feedback to curriculum developers and the relationship of evaluation of curriculum to educational research in general.

Each team prepared a country team paper on the implications for future curriculum work in their countries in terms of what had been discussed at the Seminar. This provided an opportunity to see the curriculum development as an entity which involved careful consideration of the interactions and links between subject-matter experts, evaluators and curriculum planners and implementation leaders.

The organizers of the seminar were extremely conscious of the need to discover the most appropriate strategies for follow-up of the work begun by this regional seminar and how national and regional work could be fostered for the solution of curriculum problems.

Mr. E.M. MUGIRI,
(Kenya Institute of Education, Nairobi)
Leader of the Science Panel at the
African Regional Seminar.

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INFORMATION SERVICE AVAILABLE TO SCIENCE EDUCATORS IN AFRICA

The British Council in many countries in the African region can provide to Science Educators photocopies (at modest cost) of articles, documents, etc., on science, technology and science teaching. This information service combines SATIS - a prime source of abstract information in the sciences and science education - and back-up services of the British Scientific Documentation Services (booklets available from the British Council).

SATIS is prepared by a team of experienced teachers who examine regularly over 250 journals in science, technology and education.

The Documentation service ties in with the British Library - Lending Division (BLL) and its Overseas Photocopying Services.

Consult your local British Council representative for details and costs.

AVAILABLE FROM UNESCO

1. The Development of Science and Mathematics Concepts in Young Children in African Countries. A report of a regional seminar (UNESCO/UNICEF), Nairobi, KENYA, September 1974.

2. Interactions between Linguistics and Mathematical Education. A report of the Symposium sponsored by UNESCO, CEDO and ICMI, Nairobi, KENYA, September 1974.

3. Training in Africa DIRECTORY. A Directory of Institutions for Secondary and Post-Secondary Professional Training and University Education in Africa South of the Sahara. Published by BREDA in co-operation with the Division of Training Abroad, UNESCO. Available from the UNESCO Regional Office for Education in Africa, B.P. 3311, Dakar, SENEGAL.

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